1147-15-324 **Mark Kempton*** (mkempton@mathematics.byu.edu), Department of Mathematics, Brigham Young University, 372 TMCB, Provo, UT 84602, and **John Sinkovic**, **Dallas Smith** and **Benjamin Webb**. *Cospectral vertices and isospectral reductions.* Preliminary report.

Vertices u and v of a graph G are cospectral if the adjacency matrices of G-u and G-v have the same spectrum. Aside from the inherent combinatorial interest, cospectrality is a necessary condition for perfect quantum state transfer in a graph, making this an important problem in quantum information theory. Thus, the study of cospectral vertices has received considerable attention. Vertices with a symmetry between them are cospectral, but there are interesting examples of cospectral vertices, even in the absence of symmetry. Isospectral reduction is technique developed recently in the study of dynamics on graphs. Isospectral reduction is a way of reducing a matrix to a smaller matrix with indeterminant entries while preserving spectral properties. Isospectral reduction has been used to study "latent symmetries" or "hidden symmetries" in a graph. We will show an unexpected connection between cospectral vertices and isospectral reductions. We will prove that two vertices are cospectral if and only if the isospectral reduction to those vertices has an automorphism. This gives a complete characterization of cospectrality in terms of "hidden symmetries." We will investigate how this characterization may help in constructing families of graphs with cospectral vertices. (Received January 19, 2019)